Can green LED light do a magical to plants?

Zhonghua Bian and Chungui Lu

[1]School of Animal, Rural and Environmental Science, Brackenhurst Campus, Nottingham Trent University, NG25 0QF, UK

[2]Institute of Environment of Sustainable Development in Agriculture, Chinese Academy of Agriculture Sciences, Beijing, 100081, China

Abstract

Red and blue light are the most important in driving photosynthesis to produce adequate yield. It is also believed that green light may contribute to the adaptation to growth. However, the effects of the green light which may trigger specific and necessary responses in plant growth have been underestimated in the past. In this study, lettuce (*Lactuca sativa* L.) was exposed to different continuous light (CL) conditions for 48 h by combination of red and blue light emitting diodes (LEDs) supplied with/without green LEDs in an environmental controlled growth chamber. Green light supplementation enhanced photosynthetic capacity by increasing net photosynthetic rate (P_n), maximal photochemical efficiency (F_v/F_m), electron transport for carbon fixation (J_{SPII}) and chlorophyll content, which led to increases of plant fresh and dry weight under CL treatment. Green light decreased malondialdehyde and H_2O_2 accumulation by increasing superoxide dismutase (SOD) enzyme, catalase (CAT) enzyme and ascorbate peroxidase (APX) activities after 24 h CL. Supplementary green light was also shown to lead to a significant increase in the expression of the photosynthetic genes *Lhcb* and *psb*A from 6 to 12 h and retained higher level compared with other light conditions between 12 and 24 h. The results indicate that the effects of green light on the lettuce plant growth via promoting *psb*A and *Lhcb* expression to maintain higher photosynthetic capacity and green light could alleviate the negative effects caused by CL.

Keywords: Green light, *psb*A and *Lhcb* gene expression, photosynthetic performance, continuous light, *Lactuca sativa* L.